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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOHN ERIC KLEIDER, BRUCE ALAN FETTE,
JEFFERY SCOTT CHUPRUN, CARL STEVEN GIFFORD,
and CHAD S. BERGSTROM

Appeal 2009-003654[1]
Application 09/690,993
Technology Center 2600

Decided: September 30, 2009

Before JOHN C. MARTIN, JOSEPH F. RUGGIERO, and
MAHSHID D. SAADAT, *Administrative Patent Judges*.

MARTIN, *Administrative Patent Judge*.

DECISION ON APPEAL

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[1] The real party in interest is Motorola, Inc.

STATEMENT OF THE CASE

This is an appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 12 and 13. Claims 1, 3-11, 22, and 24-30 stand allowed, and claims 14-21 stand objected to for depending on rejected claims.

We have jurisdiction under 35 U.S.C. § 6(b). We reverse.

A. Appellants' invention

Appellants' invention relates to the field of radio-frequency communication and more particularly to the field of multiple carrier communication via a portion of subchannels available within a spectrum of a wideband radio-frequency channel. Specification 1:6-10.

In the "Background of the Invention," Appellants explain that an orthogonal frequency-division multiplexing (OFDM) communication technique is a discrete multitone (DMT) modulation technique by which optimized algorithms may be utilized to appropriately allocate energy and bits to each of the plurality of subchannels, thereby allowing reliable data transfers at high rates. *Id.* at 2:1-2, 11-15. OFDM systems utilize a wideband channel frequency-multiplexed into a plurality of narrowband subchannels. *Id.* at 2:5-7. Furthermore, OFDM techniques desirably utilize a contiguous set of subchannels, thereby providing an easily implemented wideband channel, which is typical of wireline (i.e., hard-wired) communications systems. *Id.* at 2:16-19. DMT modulation has been successfully implemented for asynchronous digital subscriber line (ADSL)

communications providing improved high-speed data transfers over ordinary twisted-pair lines. *Id.* at 2:11-12, 19-22.

Problems arise when there are breaks in the spectrum of the wideband channel, i.e., when all usable subchannels are not contiguous, as is often the case with wireless communication systems. *Id.* at 2:23-26. This may occur when some subchannels contain excessive noise or other interference or are disallowed for any reason. *Id.* at 2:26-28. The prior art techniques that have been developed to compensate for such noncontiguous spectra have been unsatisfactory in various respects. *Id.* at 2:28-4:4.

Appellants' invention is said to satisfy the need for an OFDM communication technique that provides sufficient quality of service (QoS) with a high data throughput over a dynamic wideband channel and also optimizes efficiency by utilizing each subchannel within the wideband channel to its fullest. *Id.* at 4:5-9.

Appellants' Figure 2 is reproduced below.

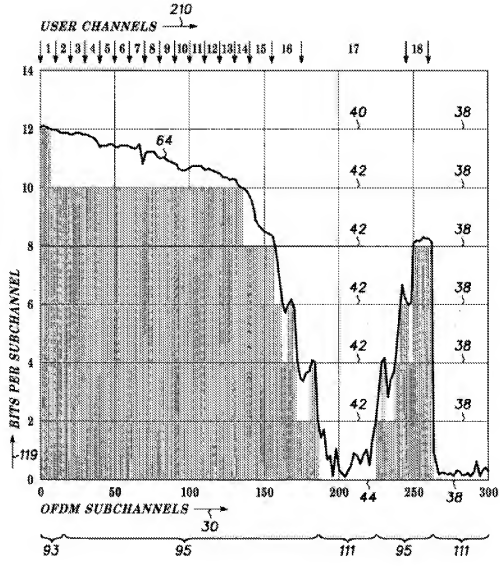

FIG. 2

Figure 2 shows a chart depicting usage of a wideband channel by Appellants' preferred embodiment of an OFDM communication system, which is depicted in Figure 1. *Id.* at 4:21-24.

In the example depicted in Figure 2, the wideband channel 24 supports eighteen user channels 210, each 100 bits wide. *Id.* at 21:3-5. OFDM transmitter 28 (Fig. 1) transmits OFDM data 34 over at least one user channel 210, wherein that user channel 210 is formed of at least one subchannel 30. *Id.* at 21:7-9. A plurality of user channels 210 would normally be used, and each user channel 210 would normally be formed of a plurality of subchannels 30. *Id.* at 21:11-13.

Appellants' invention employs a modulation profile that is produced in response to a signal-to-noise ratio (SNR) of each subchannel 30. *Id.* at 6:6-8. OFDM transmitter 28 transmits OFDM data 34 for each subchannel 30 in response to this modulation profile. *Id.* at 6:8-11.

Appellants' method and system desirably optimize efficiency by utilizing each subchannel 30 within the wideband channel 24 to its fullest. *Id.* at 21:22-24. That is, the subchannels found to have substantially no noise and/or interference (i.e., "clear subchannels") 93 (Fig. 2) are fully utilized, the subchannels found to have excessive noise and/or interference (i.e., "obstructed subchannels") 111 are excluded, and the subchannels found to have some but not excessive noise and/or interference (i.e., "impeded channels") 95 are partially utilized to the maximum extent possible. *Id.* at 19:26-27; 21:24-31.

B. The claims

The rejected claims read as follows:

> 12. A method of orthogonal frequency-division multiplex (OFDM) communication via a plurality of subchannels within a noncontiguous wideband channel, said method comprising:
>
> producing a modulation profile of said wideband channel, wherein said modulation profile is responsive to a signal-to-noise ratio (SNR) for each subchannel in said plurality of subchannels within said wideband channel; and
>
> transmitting OFDM data in response to said modulation profile; and
>
> wherein said transmitting activity transmits said OFDM data over the plurality of subchannels, from which more than one user channel is formed and concurrently supported.
>
> 13. An OFDM communication method as claimed in claim 12 wherein each of said user channels comprises at least one of said subchannels.

Claims App., Br. 10-11.

C. The references and rejection

The Examiner relies on the following references:

Polley et al. ("Polley")	US 6,363,109 B1	Mar. 26, 2002
Yamano et al. ("Yamano")	US 6,445,731 B1	Sep. 3, 2002

Claims 12 and 13 stand rejected under 35 U.S.C. § 103(a) for obviousness over Polley in view of Yamano.

THE ISSUE

Appellants have the burden on appeal to show reversible error by the Examiner in maintaining the rejection. *See In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006) ("On appeal to the Board, an applicant can overcome a rejection by showing insufficient evidence of *prima facie* obviousness or by rebutting the *prima facie* case with evidence of secondary indicia of nonobviousness." (citation omitted)).

The principal issue is whether Appellants have shown that the Examiner erred in concluding that it would have been obvious in view of Yamano to modify Polley so as to use one or more subchannels of a wideband channel as a first user channel while concurrently using one or more of other subchannels of the wideband channel function as a second user channel.

PRINCIPLES OF LAW

"[T]he examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability." *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). A rejection under 35 U.S.C. § 103(a) must be based on the following factual determinations: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) any objective indicia of non-obviousness. *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1360 (Fed. Cir. 2006) (citation omitted).

"The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1161 (Fed. Cir. 2007) (quoting *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007)). Discussing the obviousness of claimed combinations of elements of prior art, *KSR* explains:

> When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. *Sakraida* [*v. AG Pro, Inc.*, 425 U.S. 273 (1976)] and *Anderson's-Black Rock*[*, Inc. v. Pavement Salvage Co.*, 396 U.S. 57 (1969)] are illustrative–a court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions.

KSR, 550 U.S. at 417. If the claimed subject matter "involve[s] more than the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for the improvement," *id.*,

> [o]ften, it will be necessary . . . to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.

Id. at 418. "To facilitate review, this analysis should be made explicit." *Id.* That is, "there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *Id.* (quoting *Kahn*, 441 F.3d at 988).

ANALYSIS

Polley discloses a method and device for dealing with clipping problems wherein the receiver compensates for standards compliant transmitted signals using a relatively low-complexity Analog Front End ("AFE"). Polley, col. 2, ll. 34-37.

Figure 1 of Polley is reproduced below.

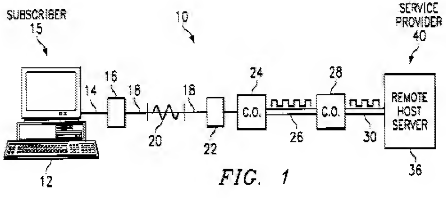

FIG. 1

Figure 1 is a diagram illustrating a communications system wherein Polley's invention can be practiced. *Id.* at col. 3, ll. 55-56. Data from the first processing system 12 is passed to the first modem 16, modified appropriately with signal processing techniques to prepare the data for robust transmission, and converted using a digital to analog convertor or other similar conversion device. *Id.* at col. 5, ll. 41-45. Next, the modem 16

transmits the converted digital stream using a modulated analog signal carrier 20 over an analog twisted pair 18 to the central office 24, where another DSL modem 22 decodes the data and ports it to the digital backbone network 26. *Id.* at col. 5, ll. 45-50.

Polley's disclosed method involves the steps of measuring the signal-to-noise ratio ("SNR") in all operating subchannels of the transmission channel; transmitting the SNR measurements for the operating subchannels to a transmitting device on the channel; communicating data over the operating subchannels using the SNR measurements to affect the throughput of data transmitted over the channel; exploiting the lowered throughput of the transmitted data to reliably compute an estimate of the clipping that occurred in the transmitter; applying the estimate of the clip to construct a compensation signal; and adding the compensation signal at the receiver to correct the clip that occurred at the transmitter. *Id.* at col. 2, ll. 44-56.

Figure 8 is a graph showing the subchannel SNR of a single received data frame for each of the 255 subchannels. *Id.* at col. 4, ll. 4-5.

The Examiner reads all of the claim 12 limitations on Polley with the exception of the following language from the "wherein" clause: "from which more than one user channel is formed and concurrently supported." Final Action 3. For such a teaching, the Examiner relies on Yamano, which discloses a method and apparatus for reducing signal processing requirements for transmitting packet-based data with a modem. Yamano, title.

In an embodiment relied on by the Examiner, packets of digital information are converted into analog signal bursts of discrete duration that are transmitted from the transmitter circuit to the telephone line, with no signal being provided from the transmitter circuit to the telephone line between the analog signal bursts. *Id.* at col. 4, ll. 36-41. A non-idle state signal can be appended to the beginning of the analog signal bursts by the transmitter circuit, thereby signaling the presence of the analog signal bursts. *Id.* at col. 4, ll. 41-44.

Yamano's Figure 3 is a block diagram of a receiver circuit 300 of a modem in accordance with one of Yamano's embodiments. *Id.* at col. 6, ll. 63-66). Figure 4 is a block diagram of a receiver circuit 400 in accordance with a burst-mode protocol. *Id.* at col. 14, ll. 1-2.

In the Final Action, the Examiner relies primarily on the "multi-drop" operation that is enabled by the burst-mode protocol, *id.* at col. 19, ll. 1-5, and depicted in Yamano's Figure 7, reproduced below.

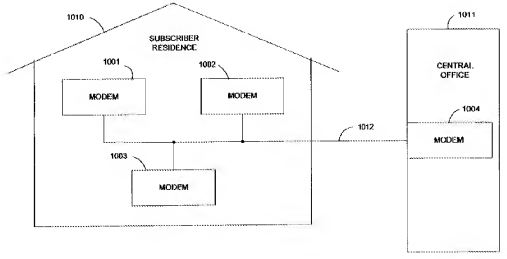

FIG. 7

Figure 7 is a schematic diagram of a multi-drop configuration that includes modems 1001-1003 in the subscriber's residence 1010 and modem 1004 in the telephone company central office 1011, modems 1001-1004 being coupled by a twisted pair telephone line 1012. *Id.* at col. 19, ll. 7-12. Any of the transmitter circuits of modems 1001-1004 can establish a session on telephone line 1012 as follows. *Id.* at col. 19, ll. 20-22. The transmitter circuits coupled to the common line 1012 can transmit packets whenever necessary, which may introduce collisions between packet information sent by the transmitter circuits. *Id.* at col. 19, ll. 23-26. A better solution is to use a carrier sense multiple access (CSMA) scheme, where each transmitter circuit listens to the communication channel prior to sending packet information. *Id.* at col. 19, ll. 26-29. A common extension to CSMA is

CSMA/CD, in which transmissions are immediately terminated if collisions are detected. *Id.* at col. 19, ll. 29-31.

In discussing Figure 7 and its associated description at column 19, lines 1-15, the Examiner also cites column 5, lines 12-30:

> Yamano et al. teaches that the transmitting activity (Fig. 7 element 1004 from center office and column 5 lines 12-25 and column 19 lines 1-15) transmits said OFDM data to more than one user channel [that] is formed and concurrently supported (Fig. 7 elements 1001-1003 at subscriber residence and column 5 lines 12-25 and column 19 lines 1-15) in order to reduce the number of receiver circuits required to handle information (column 5 lines 26-30) so that the interference between them can be reduced.

Final Action 3. The cited lines in column 5 read as follows:

> In accordance with another embodiment of the present invention, a plurality of remote transmitter circuits, which are coupled to separate telephone lines, generate analog signal bursts in accordance with the burst mode protocol. The separate telephone lines are connected together at a central location where the analog signal bursts are multiplexed to a number of receiver circuits. A non-idle detector is coupled to receive the analog signal bursts from each of the transmitter circuits, and to detect the presence and absence of the analog signal bursts on the telephone lines. Typically, only a small number of the telephone lines will be transmitting analog signal bursts at any given time. The analog signal bursts are therefore multiplexed into a number of receiver circuits which is less than the number of telephone lines. That is, each receiver circuit can process analog signal bursts from a plurality of telephone lines. As a result, the number of receiver circuits required to handle information from a given number of telephone lines is advantageously reduced.

Yamano, col. 5, ll. 12-30. Our understanding of the above-quoted passage is that it summarizes the operation of the multi-line network access circuit 500

depicted in Yamano's Figure 5 (described in detail at column 16, line 7 to column 18, line 67) rather than addressing the multi-drop configuration of Figure 7.[2] Although the Answer (at 4) repeats the above-quoted paragraph from page 3 of the Final Action that cites column 5, the Examiner's position as stated in the Answer does not appear to rely on that column.[3]

Instead, the Examiner makes the following more detailed findings regarding the "multi-drop" configuration depicted in Figure 7:

> Column 19, lines 1-15, of Yamano's reference teaches a multi-drop configuration that multiple modems are connected to the same communication channel or a single telephone line. Column 19, lines 22-38, Yamano further teaches that CSMA/CD is used where each transmitter circuit listens to the communication channel and CSMA is commonly used in the Ethernet field, where all communications happen on the same wire and any information sent by one computer is received by all, even if that information is intended for just one destination. It is clear that Yamano teaches

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[2] The "non-idle detector" mentioned in line 18 of column 5 clearly corresponds to non-idle detector 450 in Figure 5.

[3] In any event, we agree with Appellants that

> [w]ith regards to the portion of the specification corresponding to col. 5, lines 12-25; there is no concurrent support of more than one user channel. In fact each remote transmitter circuit is expressly identified as being coupled to separate telephone lines (col. 5, lines 13-14), where they are separately multiplexed and correspondingly coupled to any particular receiver circuits (see col. 5, lines 16-18 and col. 5, lines 32-33). In essence, each transmitter is received at a switch, which selectively couples the transmitter circuit to a receiver circuit.

Br. 4.

> that more than one user channel is formed and concurrently supported.

Answer 4.

Based on Yamano's multi-drop configuration (Fig. 7) and a multi-cast feature newly cited in the Answer and addressed *infra*, the Examiner concluded that

> [i]t would have been obvious to one of ordinary skill in the art at the time of the invention was made to include the system structure as taught by Yamano et al. in which the transmitting activity transmits said OFDM data to more than one user channel is formed and concurrently supported, into Polley's OFDM communication system structure in order to reduce the number of receiver circuits required to handle information so that the interference between them can be reduced.

Answer 5. We agree with Appellants that the Examiner's reliance on Yamano's description of the multi-drop feature at column 19, lines 1-38, is misplaced. As Appellants correctly point out, those lines "expressly teach[] a single channel, which is shared in a non-concurrent fashion. 'In multi-drop operation, multiple modems connected are connected to the same communication channel using time-division multiplexing.' (emphasis added) Yamano et al., '731, col. 19, lines 3-5." Reply Br. 2. This teaching would not have been understood to suggest modifying Polley so as to use one or more subchannels of a wideband channel as a first user channel while *concurrently* using one or more other subchannels of the wideband channel as a second user channel, as required by claim 12.

As noted above, the Examiner additionally relies on Yamano's disclosure of a multi-cast feature. That feature is described in connection with Yamano's Figure 9, reproduced below.

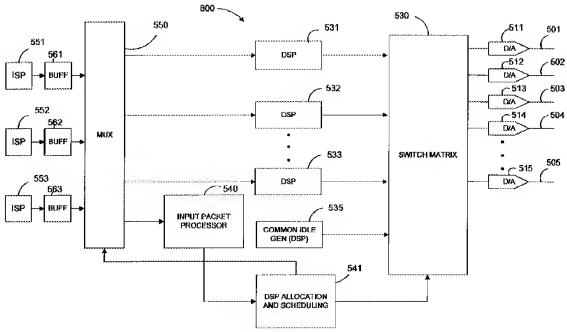

FIG. 9

Figure 9 is a block diagram of a multi-line network access circuit 800 in accordance with another embodiment of Yamano's invention. Yamano, col. 21, ll. 14-16. When ISP 553, for example, is to transmit the same data packet 903 (Fig. 10) to each of telephone lines 501-505, the multiplexer 550 is controlled to route the data packet to one of DSP resources 531-533 (e.g., DSP resource 531). *Id.* at col. 22, ll. 42-46. DSP allocation and scheduling circuit 541 causes switch matrix 530 to route the output signal provided by DSP 531 to each of D/A converters 511-515, thereby causing the data packet to be simultaneously multi-cast on telephone lines 501-505 using a single

one of DSP resources 531-533, as shown in Figure 10. *Id.* at col. 22, ll. 46-51. The Examiner equates telephone lines 501-505 to the recited "user channels":

> Yamano teaches a multi-cast transmission scheme [in which] the data packet 903 (Fig. 10) is simultaneously multi-cast on telephone lines 501-505 (Fig. 9 and 10) using a single one of ISP resource 553 (Fig. 9 and 10) (column 22, lines 49-51). That is, there are more than one telephone lines (user channels), 501-505, which are established and supported to receive the data packet 903 from the information source, ISP, 553.

Answer 5.

We agree with Appellants that the Examiner's reliance on Yamano's multi-cast feature is misplaced because telephone lines 501-505 are separate channels rather than parts of a single wideband channel:

> To the extent that the Examiner refers to more than one telephone lines in a separate portion of the relied upon reference (i.e. col. 22, lines 42-44; FIG. 10), the multiple telephone lines 501-505 only serves to highlight a context which is inconsistent with either the claims or the teachings of the primary reference, as the multiple telephone lines no longer relate to the transmission of OFDM data over the plurality of subchannels within a noncontiguous wideband channel. Each telephone line relates to a separate physical connection within which signals can separately propogate [sic], and therefore contextually is inconsistent with the claims or the claimed OFDM environmental context.

Reply Br. 2-3. Yamano's multi-cast feature would not have been understood to suggest modifying Polley so as to use one or more subchannels of a single wideband channel as a first user channel while concurrently using one or

more other subchannels of the wideband channel as a second user channel, as required by claim 12.

For the foregoing reasons, the rejection of claim 12 for obviousness over Polley in view of Yamano is reversed, as is the rejection of dependent claim 13 on that ground.

CONCLUSION

The rejection of claims 12 and 13 under 35 U.S.C. § 103(a) for obviousness over Polley in view of Yamano is reversed.

REVERSED

babc

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